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ISRAEL STRIVES HARD TO DEVELOP SPACE TECHNOLOGY

by

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Xu Xing

Translation of "Yi Se Lie Nu Li Fa Zhan Kong Jian Ji Shu"; Aerospace China, No.12, December 1991, pp 25-29

At the present time, the focus of Israel's space flight programs is to develop civilian communications satellites, and, in conjunction with this, to begin to work for the marketing of Israeli carrier rockets abroad. Another plan, which is related to space flight, is the joint Israeli-U.S. development of the Arrow missile.

Fig.1 Top Section Is Israel's Shavit Carrier Rocket. Bottom Section Is the Ofeq-2 Satellite in the Process of Installing Solar Energy Panels.

On 19 September 1988, with the support of the Israeli Space Agency (ISA), an Ofeq-1 satellite developed by the Israeli Aircraft Industry company (IAI) was launched by the Shavit carrier rocket developed by IAI, thus making Israel into one of the 8 nations in the world that have used carrier rockets of their own country to successfully launch into orbit their own nations' satellites. The Ofeq-1 satellite is specialized for use in experiments on the properties of satellite solar powered electricity generating systems under vacuum and microgravity conditions. During space flights of 118 days, the Ofeq-1 satellite gathered data related to space environments and geomagnetic fields. The height of the satellite in question is 2.3 meters. It weighs 156 kilograms. It travels from east to west in low elliptical orbit. The period of revolution is 90 minutes. The perigee is 250 kilometers. It is said that this launch iteration was carried out from Paermaqing (phonetic) air force base. The satellite's revolving from east to west is because, if it were launched toward the east, it would then have to fly through a number of sensitive areas, which might possibly give rise to unnecessary trouble. Launching toward the west, however, the firing is then in the direction of the Mediterranean Sea. This is disadvantageous with regard to launching, and an amount of useful load mass is lost.

Israel's second satellite--Ofeq-2--was already launched on 3 April 1990 by IAI with the assistance of ISA. It is similar in size to Ofeq-1. The points of difference are that Ofeq-2 possesses two way communications capabilities associated with transmitting surface control station commands and carrying out remote control of systems on the satellite. The Ofeq-2 satellite revolves in an elliptical orbit 210x1500 kilometers.

The two experimental satellites described above are the foundation for supplying Israel with continued development of its space technology. IAI forecasts that Israel will develop even more Ofeq satellites. Israeli space experts believe that Ofeq-3 and Ofeq-4 satellites will coordinate the use of experimental telescopes for scientific observations in space.

IAI originally planned to launch the Amos geostationary communications satellite, which it is in the process of developing at the present time, at the end of 1992 with an Arian rocket (see Fig.2). The Amos system is composed of a total of 12 transponders on two satellites. Operations are primarily in the Ku-wave band. Using 1° and 25° beam coverage ranges, it supplies communications services for Israel. Due to a shortage of funds, Amos communications satellite launches may be postponed.

Israel's space technology may possibly be applied to military affairs in the future. However, at the present time, because of tight funding, this has not yet started. /26

IAI's MBT system and space technology sections are the prime contractors for Israel's important space projects. IAI has already put in large amounts of funding for space plans. IAI also

developed the Amos communications satellite jointly with a London communications satellite company. The majority of subcontractors associated with various types of satellite projects are Israeli military industrial companies. Among these are the Elisra company. This firm primarily produces modular type antennas as well as reception, processing, and display apparatus associated with satellite data systems. The Soreq nuclear research center is responsible for the reliability of experimental satellites and evaluation operations associated with design approval tests. Israel's Lafaer (phonetic) ordnance development bureau is responsible for hydrazine propellant subsystems used in association with attitude control of scientific satellites orbital corrections.

Fig.2 Israel's Geostationary Orbit Communications Satellite Amos

The Elta subdivision of the IAI company is the primary subcontractor associated with the Amos communications satellite and command communications lines. It is responsible for tracking and telemetry communications lines as well as microwave transponder subsystems.

IAI has already planned on taking the Shavit carrier rocket and putting it into the international commercial space launch market. The Shavit rocket is one of the opponents in competition with NASA's Comet commercial experimental vehicle. In order to make the three stage solid Shavit rocket achieve success in competition, IAI has already carried out cooperative work with the U.S. Delta research company. The Shavit rocket's weight is light, and it is appropriate for use in launching low earth orbit useful loads.

People infer that Israel already possesses the capability to launch ballistic missiles. Moreover, the Ofeq satellite manufacturing firm IAI is also the manufacturer of the Arrow

counter tactical ballistic missile system. The designed intercept speed of the Arrow missile is M10. Altitude is 30km. The range is 70km. It possesses the capabilities of an intermediate range missile. In conjunction with this, it is capable of protecting inhabited areas within a region with a radius of 100km. It is said that Israel has manufactured at least two generations of long range missiles. Nations in the Middle East region are very sensitive with regard to the developing of ballistic missiles. As a result, even purely commercial launches will still create psychological pressure.

ISA was created in 1983. It is responsible for setting out and managing Israel's space plans. However, one type of project--the Arrow missile--is an exception. Besides this, it is also responsible for coordinating space research work in the country as a whole, and, in conjunction with that, stimulating investment associated with privately run enterprises to develop space products. At the present time, ISA is in the process of developing a gravity experimentation system (Hornet) together with NASA. ISA is also carrying out improvements of tracking radars associated with Bar Giora satellites in order to continue monitoring movements in the earth's crust.

THE WEST WILL STRENGTHEN BALLISTIC MISSILE DEFENSE

Translation of "Xi Fang Jiang Jia Qiang Dan Dao Dao Dan Fang Yu"; Aerospace China, No.12, December 1991, pp 27-29

The Gulf War was the first time that missile defense systems successfully intercepted ballistic missiles on the battlefields of a war. In this war, ballistic missile defense systems played an important role. This success will produce far reaching influences with regard to ballistic missile defense questions. After the changes produced in the international situation, the West may very possibly change defense strategies, strengthening defense against ballistic missiles.

I. CHANGES IN THE WORLD SITUATION

Western public figures believe that the world situation at the present time--as compared to the middle of the 1980's--has already given rise to fundamental changes. From now on, the missile threat to Western nations may possibly come from the south and not from the east (Soviet Union). The nations located in the regions of North Africa, the Middle and Near East, and the Indian subcontinent all possess a threat potential for war. Iraq is most certainly not the only country that possesses missiles. Libya, Egypt, Syria, Israel, Iran, Pakistan, and India all have considerable numbers of ballistic missiles.

The spread of nuclear weapons still continues. Even if the East and West have reached an agreement strictly prohibiting the handing over of technologies related to nuclear weapons, nuclear weapons are still continuing to proliferate. This is because there are a number of nations--in particular, some countries in South America and the Middle East--which already possess the capability to produce missiles. Moreover, they are in the process of producing, together with other nations, or helping other nations to develop missiles--for example, Brazil has aided Iraq in the development of missiles. The only method to block the spread of missiles is to carry out far reaching world cooperation. However, at the present time, opportunities for this type of cooperation are very limited.

Besides this, the success of the Patriot missile in the Middle East will not reduce the development of ballistic missiles by Third World countries. In any situation, the great ambition of the majority of Arab and Islamic countries to develop ballistic missiles will not be reduced at all. Despite the fact that only a very small number of Fleet Footed Runner (SCUD) missiles broke through defense networks and hit Israel, it is still seen, however, as a huge victory. Because of this, it has destroyed the myth of

Israeli invincibility.

As far as ballistic missiles in the 1990's are concerned, other countries besides those in Europe continue step by step to proliferate "laterally". They will also spread "longitudinally". To put it another way, this is nothing else than the ranges and numbers of the missiles associated with these countries both continuing to increase. Useful loads and accuracies will also continue to increase. There are a number of nations which--in the 1990's--will even develop successful, actual intercontinental ballistic missiles. It is said that, early in 1989, Iraq carried out tests of a type of missile (TAMMUZ 1) with a range of 2000 kilometers. In the same year, India also carried out flight tests of the Agni missile with a range exceeding 2500 kilometers.

Fig.1 First Firing of Iraq's TAMMUZ 1 Missile

It is estimated that Third World countries will also develop ballistic missiles carrying nuclear, biological, and chemical (NBC) warheads. These weapons possess very great capacities to kill and wound. Iraq is one of the nations that takes the lead in developing these weapons.

Western units deployed in NATO or other areas are also capable of being subjected to severe threats from short range missiles. If Third World countries have missiles with conventional warheads of very great accuracy, then, this type of threat will progressively increase.

Besides this, the possibility of carrying out unintentional, unauthorized missile attacks against Europe also exists. For instance, if the Soviet Union exploded into a long term civil war, this type of possibility would then come up.

Another important difference between the international situation at the present time and the middle 1980's is the change in attitude of the Soviet Union. In the last few years, the Soviet Union has made public even more about its missile defense systems. This is because of detente in the relationships between East and West as well as the Soviet Union's recognition that missiles were in the process of proliferating on their doorstep. From this, it can be seen that, in terms of this problem, it is possible that the Soviet Union and Western countries could cooperate in a limited way. As a result, the missile defense policies of Western nations should change. /28

Fig.2 The Patriot Missile, Which Has Counter Missile Capabilities, Intercepts a Lance Missile

II. THE ROLE OF THE PATRIOT MISSILE IN THE GULF WAR

During the Gulf War, multinational units deployed approximately 10-12 Patriot missile battalions (each battalion had 6 launchers) in the region in question. Patriot air defense systems, during the interception of Iraqi missiles, achieved victories far, far exceeding the results which had been predicted by a good number of experts. During this war, the 158 Patriot missiles fired intercepted or interfered with 45 Fleet Footed Runner (SCUD) missiles of the 83 that were fired toward Israel (39) and Saudi Arabia (44). Moreover, in reality, the interception rate associated with Patriot missiles must be higher than the figures above (45/83). This is because there were a number of Fleet Footed Runner (SCUD) missiles which had errors which were too great when attacking targets, and it was not necessary to intercept them. Despite the fact that Patriot missiles were not able to block large pieces of missile fragments or entire warheads from falling on populated areas, generally speaking, however, the performance of the missile systems in question was good. Because Patriot missiles were originally a type of air defense system and not a type of counter tactical ballistic missile system, it was only after going through the carrying out of nearly half a year of improvements to software and warheads that the missiles in question were then able to achieve counter tactical ballistic missile capabilities. Despite the fact that this is the case, Patriot (PAC-2) missiles are still, at the present time, the only missile defense system already in service in the world, and, in conjunction with that, is in production and has gone through combat testing.

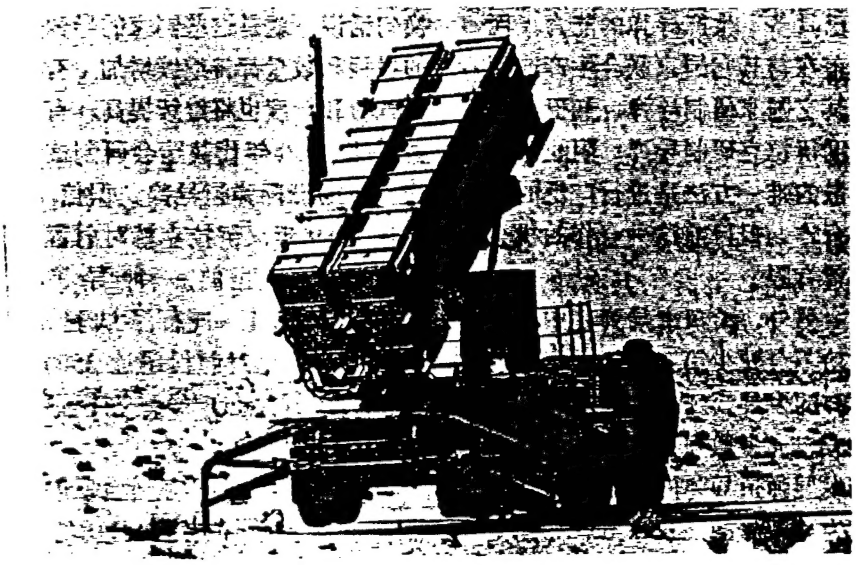

Fig.3 Patriot Missile Launcher Deployed in Saudi Arabia

Patriot missiles have already proved that their technology is feasible to defend against conventional missiles. Not long after Patriot missiles intercepted Fleet Footed Runner (SCUD) missiles for the first time, the questions associated with the redevelopment of missile defenses and the expansion of air defense capabilities, which had not been necessary originally because of detente between the East and the West, have drawn people's attention anew. The political and strategic significance produced by Patriot missiles successfully intercepting Fleet Footed Runner (SCUD) missiles in the night skies over Telaweifu (phonetic), Riyadh, and Dahran is particularly important. The meanings can be summed up in at least the 3 points below.

1. As is the case with air defense in general, missile defenses are able to reduce the methods of preemptive attack which are adopted in crises to gain the initiative. This is also nothing else than to say that they possess effects associated with defusing wars and aid in stopping the escalation of wars.

2. Even if missile defense success rates do not reach 100%, in an environment of crisis and war, they are very useful, however, with regard to the area of stabilizing the morale of inhabitants who are subject to threat. During the period of the Gulf War--no matter whether it was Israel or Saudi Arabia--the results which missile defense produced in this regard in the political and psychological areas were clear and easy to see. /29

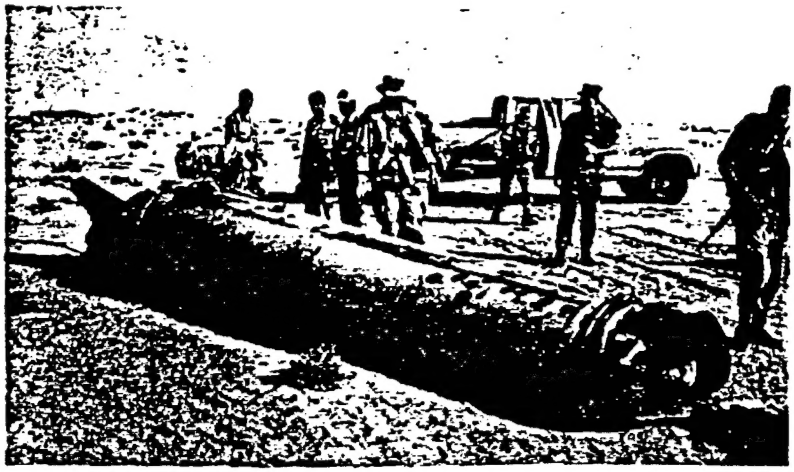

Fig.4 Wreckage of Fleet Footed Runner (SCUD) Missile Destroyed by Patriot Missile

3. After war breaks out, missile defense capabilities provide the policy makers of a nation comparatively large degrees of political freedom. The more effective the air defense and missile defense systems of a country are, the smaller are the domestic pressures to decide on the use of methods which escalate the war to make immediate counterattacks. This clearly shows that missile defense increases the possibility of politics strictly controlling the implementation of military activities. During the Gulf War, this advantage was even more obvious. After Iraq's Fleet Footed Runner (SCUD) missile attacks on Israel, if Israel had immediately carried out large scale counterattacks, then, the anti-Iraqi coalition would have been faced with a danger of disintegration. Besides this, the Gulf War clearly showed that air force offensive counterattack units (OCA) are not capable of replacing effective missile defense forces. During close to 6 weeks of air war, despite the fact that multinational air forces had absolute air supremacy, and, in conjunction with that, carried out large scale bombing, and with the U.S. possessing, moreover, advanced aerial reconnaissance aircraft as well as Iraqi terrain which also facilitated OCA strikes against Iraqi mobile missile systems, multinational unit air forces, however, were not able to eliminate the Iraqi missile threat.

III. THE WEST STRENGTHENS BALLISTIC MISSILE DEFENSE

Important Western figures believe that--faced with a new situation--the West must draw up a new European air defense plan. In 1989, NATO air defense headquarters (NADC) put forward a series of defense system modernization measures. In view of experiences associated with the Gulf War, recommendation of the relevant measures described above may give rise to new interest among Western nations.

First of all, in this recommendation, NADC put forward several passive defense measures--for example, camouflage, defensive works, deception and jamming. During the Gulf War, both sides made effective use of these measures.

Secondly, the recommendation in question also puts forward the adoption of active defense measures. Among these are included the carrying out of improvements with regard to all conventional air defense systems--for example, Roland, Rapier, Sidewinder, and Hawk. However, research clearly shows that taking all the systems described above and changing them into defense systems that possess antimissile capabilities is not worthwhile considered in terms of expense and results. During the Gulf War, use was only made of advanced Patriot missiles, and the terminal phases of ballistic missile flights were successfully intercepted.

In the Gulf War, one of the reasons Patriot missiles were successful was due to the fact that Fleet Footed Runner (SCUD)

missile range and design plans have limitations. Missiles are only capable of firing toward target areas from one direction. In this way, the work of positioning and direction finding associated with Patriot missile systems was then simplified. In conjunction with this, it compensated for the drawback of a short range when the missile in question is utilized as a counter missile missile. If it is desired to protect larger ranges or to intercept missiles attacking from multiple directions, difficulties are, by contrast, much greater. The handling of attacks associated with various types of different ballistic missiles requires a completely different defense system.

As a result, the only option is to develop a new generation of defense systems in order to replace old weapons systems. The NATO countries of Europe have expressed satisfaction with the tactical and technical indices associated with follow on models of the Hawk missile system. In conjunction with this, agreement has been reached on it.

As far as the need to make the Hawk missile in the 21st century possess adequate counter missile and antiaircraft capabilities is concerned, development of follow on models should be begun immediately, and, in conjunction with this, accelerate the course of the work. Analyses clearly show that the costs associated with developing follow on models of the Hawk system almost cannot be lower than the costs of the Patriot system. As a result, Europe plans to carry out joint development with the U.S. in every way possible.

NATO air defense headquarters has then carried out studies on how to destroy in their positions missiles on enemy launchers as a part of the same problem. To a certain extent, multinational units during the Gulf War achieved practical realization of this method. This was seen as one type among combat missions attacking enemy aerial weapons that were berthed on the surface. More expenditures were not necessary. This type of offensive war of destruction is only capable of acting as a supplement to defensive missile interception and cannot replace it.

The condition for realizing all the measures described above as well as the effective deployment of weapons systems is that there must be a type of advanced early warning, command, and control system similar to the one used by the U.S. and Allied forces during the Gulf War. NATO has already carried out research with regard to Europe's developing technology associated with a similar type of modernized system. In the general run of conventional wars, [text incomplete]